

Listing of Claims:

Claims 1-34 (Canceled).

35. (New) A light beam switching and adjustment device comprising:

(i) a light guide substrate which comprises:

at least one input port,

5 a plurality of output ports,

at least one mirror receiving recess formed in one surface of the light guide substrate, and

10 a plurality of light guides that conduct light input into the at least one input port to a selected at least one output port of the plurality of output ports; and

(ii) an actuator substrate which comprises:

15 at least one mirror which is adapted to advance into and retract from a corresponding one said at least one mirror recess, and

at least one actuator disposed in a position corresponding to a corresponding one said at least one mirror to support the corresponding mirror,

20 wherein the at least one actuator is operable to position the corresponding mirror in a first position in which the mirror is advanced into the corresponding mirror receiving

recess and in a second position, which is closer to a first surface of the actuator substrate than the first position, in which the mirror is retracted from the corresponding mirror receiving recess, and

25 wherein the plurality of light guides conduct the light to the selected at least one output port in accordance with selective advancement and retraction of the at least one mirror with respect to the corresponding mirror receiving recess;

30 (iii) first alignment marks on the light guide substrate; and

 (iv) second alignment marks on the actuator substrate;

 wherein when the first alignment marks are aligned with the second alignment marks, the light guide substrate and the actuator substrate are aligned such that the at least one mirror 35 is aligned with the corresponding at least one mirror receiving recess such that each said at least one mirror is able to advance into and retract from the corresponding one said at least one mirror recess.

36. (New) The light beam switching and adjustment device according to claim 35, wherein the first and second alignment marks are observable via infrared light.

37. (New) The light beam switching and adjustment device according to claim 35, wherein the first alignment marks are formed on said surface of the light guide substrate, the second alignment marks are formed on said first surface of the actuator substrate, and the actuator substrate permits transmission of infrared light therethrough.

5 38. (New) The light beam switching and adjustment device according to claim 35, wherein supply of electric power to the actuator substrate is performed directly to the actuator substrate from outside.

39. (New) The light beam switching and adjustment device according to claim 35, wherein the at least one mirror comprises a plurality of mirrors, the at least one mirror receiving recess comprises a plurality of mirror receiving recesses respectively corresponding to the plurality of mirrors, and the at least one actuator comprises a plurality of actuators respectively corresponding to the plurality of mirrors; and

10 wherein the actuator substrate further comprises a plurality of feed terminals for use in electrically driving the actuators, said plurality of feed terminals including: at least one feed terminal of a first type to perform feeding for individually driving a corresponding one of the actuators, and at least one

15 feed terminal of a second type used to perform feeding for
collectively driving all of the actuators to position all of the
mirrors in the second position.

40. (New) The light beam switching and adjustment device
according to claim 39, further comprising a driving circuit
mounted on the actuator substrate for driving the actuators to
perform optical switching operations in accordance with signals
5 supplied to the terminals of the first type, and to position the
mirrors in the second position when predetermined signals are
supplied to the terminal of the second type.

41. (New) The light beam switching and adjustment device
according to claim 39, wherein each of the mirrors comprises at
least one concavo-convex portion, and an insertion depth of said
each of the mirrors in the corresponding mirror receiving
5 recesses is observable by using the concavo-convex portion as a
focusing reference for microscopic observation.

42. (New) The light beam switching and adjustment device
according to claim 35, wherein the light guide substrate and the
actuator substrate are joined with a spacer interposed
therebetween to separate the light guide substrate and the
5 actuator substrate by a thickness of the spacer, such that the at

least one mirror is completely retracted from the corresponding mirror receiving recess when in the second position.

43. (New) The light beam switching and adjustment device according to claim 42, wherein the spacer is positioned to surround a region of the actuator substrate in which the at least one mirror is provided.

44. (New) The light beam switching and adjustment device according to claim 43, wherein a space between the light guide substrate and actuator substrate is filled with a refractive index adjusting liquid such that the refractive index adjusting liquid enters the at least one mirror receiving recess, said refractive index adjusting liquid having a refractive index that is substantially the same as a refractive index of core layers of the light guides; and

wherein the spacer forms a part of a sealing structure that contains the refractive index adjusting liquid.

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45. (New) The light beam switching and adjustment device according to claim 35, further comprising a relay substrate which relays electrical connections to the actuator substrate;

5 wherein the relay substrate is joined to a second surface of the actuator substrate such that a portion of the relay substrate protrudes from the actuator substrate.

46. (New) The light beam switching and adjustment device according to claim 45, further comprising:

a plurality of first pads for electrical connections formed on the first surface of the actuator substrate;

5 a plurality of second pads for electrical connections formed on a surface of the relay substrate adjacent to the actuator substrate and on the portion of the relay substrate that protrudes from the actuator substrate; and

10 a plurality of third pads for electrical connections formed on the relay substrate, each of the third pads being electrically connected to one of the plurality of second pads;

wherein the plurality of first pads and plurality of second pads are respectively electrically connected to each other by bonding wires.

47. (New) The light beam switching and adjustment device according to claim 46, further comprising a substrate which includes a plurality of lead terminals for external connections;

5 wherein the plurality of third pads and the plurality of lead terminals respectively electrically connected to each other by bonding wires.

48. (New) The light beam switching and adjustment device according to claim 46, further comprising a plurality of conductive parts which are formed on the relay substrate and which are respectively electrically connected to a plurality of 5 the plurality of second pads;

wherein a disposition pitch of at least a part of each of the plurality of conductive parts is wider than a disposition pitch of the plurality of second pads and a disposition pitch of the plurality of third pads.

49. (New) The light beam switching and adjustment device according to claim 48, wherein the plurality of conductive parts are formed on the surface of the relay substrate adjacent to the actuator substrate and on the portion of the relay substrate that 5 protrudes from the actuator substrate; and

wherein the plurality of third pads are formed on a surface of the relay substrate on an opposite side of the relay substrate with respect to the actuator substrate.

50. (New) The light beam switching and adjustment device according to claim 48, each said at least one are positioned by the corresponding actuator in the second position when specified signals are respectively supplied to the plurality of conductive parts.

51. (New) The light beam switching and adjustment device according to claim 48, further comprising a driving circuit mounted on the actuator substrate for driving the actuators to perform optical switching operations in accordance with signals supplied to the plurality of third pads, to position the at least one mirror in the second position when predetermined signals are supplied to the plurality of conductive parts.

52. (New) A method for manufacturing a light beam switching and adjustment device, said method comprising:

(ii) preparing an actuator substrate which comprises:

at least one mirror which is adapted to advance into
and retract from a corresponding one said at least one mirror
15 recess,

at least one actuator disposed in a position
corresponding to a corresponding one said at least one mirror to
support the corresponding mirror, and

second alignment marks,

20 wherein the at least one actuator is operable to
position the corresponding mirror in a first position in which
the mirror is advanced into the corresponding mirror receiving
recess and in a second position, which is closer to a surface of
the actuator substrate than the first position, in which the
25 mirror is retracted from the corresponding mirror receiving
recess, and

wherein the plurality of light guides conduct the light
to the selected at least one output port in accordance with
selective advancement and retraction of the at least one mirror
30 with respect to the corresponding mirror receiving recess; and

(iii) aligning and joining the light guide substrate and the
actuator substrate using the first and second alignment marks to
align the first and second alignment marks;

wherein when the first alignment marks are aligned with the
35 second alignment marks, the light guide substrate and the

actuator substrate are aligned such that the at least one mirror is aligned with the corresponding at least one mirror receiving recess such that each said at least one mirror is able to advance into and retract from the corresponding one said at least one
40 mirror recess.

53. (New) The method for manufacturing a light beam switching and adjustment device according to claim 52, further comprising:

5 preparing a spacer to be joined between the light guide substrate and the actuator substrate; and

joining the spacer to one of the light guide substrate and the actuator substrate, before the light guide substrate and the actuator substrate are aligned and joined;

10 wherein when the spacer is joined between the light guide substrate and the actuator substrate, the spacer separates the light guide substrate and the actuator substrate such that the at least one mirror is completely retracted from the corresponding mirror receiving recess when in the second position.

54. (New) The method for manufacturing a light beam switching and adjustment device according to claims 52, wherein the at least one actuator is constructed so that when no signals are supplied, the corresponding mirror supported on the actuator

5 returns to a predetermined position that is farther from the surface of the actuator substrate than the second position; and wherein while aligning the light guide substrate and the actuator substrate, signals are applied to the actuator substrate to position the at least one mirror in the second position.

55. (New) The method for manufacturing a light beam switching and adjustment device according to claim 54, wherein signals are supplied to the actuator substrate to cause the at least one mirror to gradually return to the predetermined position after completion of the alignment between the light 5 guide substrate and the actuator substrate.

56. (New) A light beam switching and adjustment device comprising:

10 (i) a light guide substrate which comprises:
at least one input port,
a plurality of output ports,
at least one mirror receiving recess formed in one surface of the light guide substrate, and
a plurality of light guides that conduct light input
15 into the at least one input port to a selected at least one output port of the plurality of output ports; and

(ii) an actuator substrate which comprises:

at least one mirror which is adapted to advance into
and retract from a corresponding one said at least one mirror
20 recess, and

at least one actuator disposed in a position
corresponding to a corresponding one said at least one mirror to
support the corresponding mirror,

wherein the at least one actuator is operable to
25 position the corresponding mirror in a first position in which
the mirror is advanced into the corresponding mirror receiving
recess and in a second position, which is closer to a surface of
the actuator substrate than the first position, in which the
mirror is retracted from the corresponding mirror receiving
30 recess, and

wherein the plurality of light guides conduct the light
to the selected at least one output port in accordance with
selective advancement and retraction of the at least one mirror
with respect to the corresponding mirror receiving recess;

35 (iii) first alignment marks formed on the light guide
substrate for use in aligning the light guide substrate and the
actuator substrate; and

(iv) second alignment marks on the actuator substrate for
use in aligning the light guide substrate and the actuator
40 substrate;

wherein the first alignment marks are formed on said surface of the light guide substrate, the second alignment marks are formed on said surface of the actuator substrate, and the actuator substrate permits transmission of infrared light therethrough.